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SCIENCE AND TECHNOLOGY

No. 50

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BIOTECHNOLOGY

GOVERNMENT'S ENTRY INTO BIOINDUSTRY VIEWED

Paris LE NOUVEL ECONOMISTE in French 9 Feb 81 pp 38-39

[Article by Gilles Coville: "Bioindustry--The Government Is Pushing It Into Shape"]

[Text] After getting the opinion of the "biotechnologist sages," the administration has obtained the view of Polytechnical Academy graduate Jean-Claude Pelissolo. Prospects reveal specific figures connected with objectives to be attained and specific industrial projects.

Things are decidedly going very fast in the matter of biotechnology. On 12 November 1979, three "wise men" sent the president of the republic a voluminous report on "life sciences." On 14 February 1980, the administration took the first steps to improve the training of specialists and transfer from research to industry. On 2 February 1981, a restricted cabinet meeting moved on from looking into prospects and general policies to specific objectives and the related figures as well as to specific industrial projects.

Caution

This is a perilous exercise for any nascent technology, especially for biology, which at will mixes the prospects of miracles and the mysteries of living things. The as yet unpublished report by Mr Jean-Claude Pelissolo, who basically formulated these decisions, however is not devoid of caution. "Biotechnology is going to experience its 10 most difficult years. After the bright hopes raised by the initial results of genetic engineering, we are going to enter a period of doubts and uncertainty," concluded this graduate of the Polytechnical Academy who for the past 3 months has been concerned most intensively with cell metabolisms as applied to the industry. The precision in the administration's decisions is quite in line with this approach.

Between now and 1985, F10 billion in industrial investments will have to be channeled toward the biotechnology line and the business volume of the industries involved will have to be multiplied by three from F6 to F18 billion. The chief architect of this mobilization is the CODIS (Guidance Committee for the Development of Strategic Industries), the apple of the eye of Industry Minister Andre Giraud. The CODIS already has studies in its files representing F2 billion in investments. SEMA,

which conducted an international market study for the latter, estimates the world-wide business volume, which the biological industry establishments could get, at F170 billion in 1990 and F400 billion in the year 2000.

More specifically, four pilot projects were selected to "get the French scientific-industrial machine going."

Manufacture of Carburol

This synthetic fuel can be obtained either through fermentation of sugar (the ethanol line) or through enzyme hydrolysis involving cellulosic products (the acetone-butanol line). There are two biotechnological lines which, in the eyes of the experts in the Industry Ministry, carry great merit. The "industrial groups that might be interested," in plain language, the oil companies, have powerful financial resources. These production lines also involve semifinished items which could serve as bases for a vegetable carbon chemistry.

Production of Proteins for Animal Fodder

This is one of the items where the French balance of trade shows a serious deficit: F4.5 billion must be imported in American soybeans or Thai cassava. The culturing of single-cell organisms on unconsumable substrates, such as the lacto-serums which are dumped by the cheese factories or the many byproducts from the agricultural food industry will lead to products that are very rich in proteins. By way of extension, an entire industry must be created here to recover and process what is now considered to be waste. ("A real economic mess," notes Mr Pelissolo in his report.)

Vegetable Seed Industry

The technocrats discovered that France, a big agricultural power, just barely achieved a balance in its foreign seed trade and that it pays more and more "royalties" for foreign seed which it copies (F13 million in 1977, F2 million in 1973). On the other hand, Dutch industry earns F1 billion every year in net foreign exchange deriving from imports. Besides, "seeds are increasingly going to be for agriculture what integrated circuits are for the electronics industry." The administration's main concern is that the research potential of the INRA [Agricultural Research Institute?] (in genetics and "in vitro" multiplication) must not remain unused.

Immunology

In other words, this is the pharmaceutical industry sector which should experience the greatest development in the form of new vaccines, antibodies, and the famous "interferons." Some people even predict that, in 1990, 40-50 percent of the world market in pharmacy of biological origin will involve immunology products. This is one field in which France has a strong hand. This is due not only to the level of its research (the Pasteur Institute and the universities of Marseille, Bordeaux, Lille, Lyon) but also its industry (Pasteur Production Institute, Merieux Institute). In an annex to this program, it will also be necessary to cover French gaps in antibiotics (F570 million commercial deficit in 1979), a field which, according to the previously mentioned SEMA study, in 1990 will still represent 9 percent of the total applications of biotechnologies and 42 percent of pharmaceutical applications alone.

There are many other projects which obviously are meritorious but whose implementation will take much time, if it ever leads anywhere. In order not to be accused of missing the bus, the administration is obviously trying to push the whole matter. According to Mr Giraud, it intends "to mobilize the forces of French research and place them in contact with industry." This is the famous "down-line control" method of which the government would like to prove, in the field of biotechnologies, that it gets the dialogue going between public researchers and private manufacturers. This is going to be a tough game. And Mr Pellissolo's analysis anticipates that rather neatly.

Obstacles

Here is the main difficulty: Each of the projects presume that scientific problems, which are as many obstacles to be removed before going on to the innovation and industrial development stage, have been resolved; that includes knowledge on microbial strains which we want to put to work (including their stability, their culture media, their metabolic lifetimes), manufacture of enzymes, regulation and automation of fermenters, etc.

At the Secretariat of State for Research, people are suspecting the divisions of the Ministry of Industry to be putting the cart before the horse. Traditional rivalries as to the areas of competence of government agencies are not making things any easier either; this involves research, on the one hand, with the DGRST [General Delegation for Scientific and Technical Research] and, on the other hand, development investments handled through CODIS.

On that score, one of the proposals made by Mr Pellissolo has not been selected for the time being; it involves the creation of an interministerial biotechnology mission, attached to the Ministry of Industry, which would be charged with "stimulating areas of competence and resources and which would have a budget accounting for 20 percent of the funds that might be allocated to that sector."

Resources

There are problems to be resolved beyond the susceptibilities of the various government agencies. Industry has only between 200 and 300 researchers in biotechnology, according to Mr Pellissolo; that is rather little when it comes to going beyond the stage of applied research or even organizing joint efforts with the public laboratories. The enterprises have even less resources for judging the economic effects to be derived from one or the other adventure. Result: A certain wait-and-see attitude prevails among manufacturing circles.

Biotechnology is the industry of living things and must also go in for microprojects and small teams. The innovative mobility and flexibility of resources, required for moving on to new techniques, are not the two most widespread virtues found in the big enterprises of which we expect that they will thoroughly commit themselves to this task. "Let us remember," notes Mr Pellissolo, "that none of the Americans who, during the fifties, manufactured electronic tubes (Westinghouse, General Electric, RCA) succeeded in getting into the transistor field, that is, the integrated circuits. The giants of the "electronic bug" are all newcomers (Texas, Fairchild, Motorola, Intel)." Those who will build the industry of "little beasties" perhaps have just been born.

BIOTECHNOLOGY

CODIS TO DEFINE, IMPLEMENT BIOINDUSTRIAL STRATEGY FOR FRANCE

Paris L'USINE NOUVELLE in French 5 Feb 81 pp 65-66

[Article by Bertrand Le Balc'h: "The Big Five in the Bioindustry"]

[Text] Fifteen companies were contacted, ten offers were examined, and three received a favorable opinion (F1 million in aid, each): Delbard, Eurosyme, Speichim; two others are about to be accepted: Roquette Freres and the Pasteur Institute (together, these five projects represent F300 million in investments in research, production capacity increase, etc.). That is the result of the work done by CODIM [Guidance Committee for Strategic Industries] in the matter of the bioindustry.

But, looking at the figures alone, one might overlook the essential fact, that is, the concept and information work done by that group and especially the efforts made to spell out and implement a bioindustry strategy for France: a particularly complex task.

The study group's first task thus was to identify the sectors where biotechnologies are called upon to experience strong development either on the research level or on the production level.

Its reflections were supported by the results of the survey conducted over a period of 6 months by SEMA in France, the United States, and Japan, upon request of the Ministry of Industry. On the basis of this report, CODIM selected four sectors: pharmacy, chemistry, energy, and agricultural food [industry] (products involving biotechnologies today, for these four sectors together, account for a business volume of F6 billion). Within those sectors, five products were designated as priority products: derivatives from research in immunology (interferon, diagnostic reagents), antibiotics, products derived from corn (sorbitol, glucose), seeds, and substitute fuels (methanol, ethanol).

Although started by the projects of very dynamic PME [small-size enterprises] (Roquette, for example, is the world's leading producer of sorbitol), CODIS today seeks to share its ambitions with the big industrial groups. Oddly enough, as a matter of fact, and contrary to other topics, none of those interested in bioindustry, either for a long time (Rhône-Poulenc) or just a short time ago (Moët-Hennessy, Lafarge), to this very day has filed an offer with CODIS. "We have contact with the big groups. But their strategy in the matter of bioindustry does not appear clearly or they refuse to disclose it," complains a member of the study group.

This is a delicate situation indeed. Bioindustry as a matter of fact is a heavy industry. With a business volume of F100 million, it needs between F150 and F200 million in investments. Without the financial strength of a big group, some of the objectives which the CODIS has set itself will not be attained.

Among these objectives is the effort to enable France to catch up in the antibiotics field. "We are considerably behind here. The only conceivable solution is a co-operation agreement with a foreign group, with cross-participation."

"The ideal thing would be a market of the kind where we would swap our knowledge in immunology against your knowledge in antibiotics," explained an official of CODIS. Among the foreigners we have a score of American and Japanese enterprises that might be involved in a cooperative effort of this type. In France the list boils down to just a few names: Rhone-Poulenc and its affiliate, the Merieux Institute, the Pasteur Production Institute, SANOFI (Elf-Aquitaine Group). "We are standing on shifting sands but we think that two or three agreements could be signed between now and the end of the year," adds a member of the working group.

Regardless of whether this biopharmacy effort is successful or fails, the bioindustry topic will basically be "sewed up" by the end of the year. Then the Ministry of Industry will take over from there--unless a delegation for bioindustry might be created? That is an assumption that is entirely feasible.

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CSO: 3102

ENERGY

WIND ENERGY EXPERTS SPEAK ON PROBLEMS, PROSPECTS

Electricite de France

Paris INDUSTRIES & TECHNIQUES in French 20 Jan 81 pp 7-8

[Article by Jacques Houbart: "Wind Energy: It's All Right to Dream, but not too Much"]

[Text] The impact of oil, a taste for "soft" technologies, new forms of energy are in fashion. The wind causes no less dreaming than the sun. Witness the success of the "Prospects for Energy" competition organized by the Rotring Company: 40 wind projects, proposed by engineers and technicians from the four corners of France, competing for the jury's favors. The winners (see the following pages) showed much imagination. Sometimes too much; their ideas are not all realistic, as they are not all faultless. It is all right to dream, but not too much, warns the EDF [French Electric Company]. At best, providing the French coasts are covered by a new Atlantic wall, only 1 percent of the national electrical production would be attained, say the EDF specialists. This does not prevent the Aerowatt Company from talking about second wind. After special applications like supplying ocean beacons, the company is interested today in individual applications, for which it finds a "heavy demand." The first prize-winner in the Rotring competition--a giant mechanical water heater--is a precise response to this kind of expectation.

A Marginal Potential

When Ulysses and his companions arrived in the Country of the Winds, governed by Aeolus the king, the latter received them affably and, to protect their cruise, he gave them a leather bag in which he had shut up all the dangerous winds. Thinking the bag must contain gold, the sailors opened it and reaped the storm. The Ushant Windmill accident--which, thanks to the gods, did not kill anyone--is not worthy of the Odyssey, but it inclines the EDF engineers toward prudence.

For them this form of energy constitutes one source among others capable of being converted into electricity. For many years, measures have been taken to establish

an inventory of our potential. The results obtained have made it possible to draw the map of France in terms of usable areas and to determine the potential sites for industrial equipment; when all is said and done, the possibilities are rather limited. "At best," says Roger Aureille, head of the Technical Division in charge of new forms of energy, "by installing, from Biarritz to Calais, aerogenerators that would form a new Atlantic wall, only about 1 percent of the annual supply of electricity could be produced. This source of energy should not be neglected. But other activities--in the solar or geothermal fields--represent a national potential for sanitary heating that is much more interesting."

Nevertheless, the EDF has not been simply content to wait and see. After some other experiments, one was conducted recently in Ushant with a 100-kilowatt installation. This Aerowatt Company windmill was to serve as a pilot and afterwards be reproduced in several copies destined for well-exposed regions of the overseas departments. Their needs are satisfied with the help of a diesel production using a relatively rich fuel, so that the price per kilowatt hour is very high. In those departments, profitability studies put the wind and diesel fuel into competition, especially if one takes into account the predicted rise in the price of the latter.

The machine installed in Ushant was 35 meters high at wheel level. With its two blades the wheel has a diameter of 18 meters, and produces 100 kilowatts when the wind reaches a speed of 13.5 meters per second. On the one hand it was necessary to extrapolate what had been done from the several-kilowatt machines built earlier by Aerowatt, and on the other hand to study how a system like the one in Ushant--supplied by diesels, whose power is therefore limited--would function when one added a completely uncertain source of electrical production. It was also a matter of determining how many windmills can be linked up to a given system, so that when the demand is minimal and the winds maximum, things can go well.

Perfecting the equipment was rather laborious, especially considering the difficulty with electrical supply; the aerogenerator, for nearly a year, did not run normally. Then, the machine having been coupled to the system, when they were preparing to begin testing reception, one blade broke, ruining the aerogenerator.

"For the EDF today," says Roger Aureille, "the problem is to understand why the builder could furnish a machine with such poor reliability. It is important first of all that the machine not be dangerous to the public. A blade was thrown 150 meters from the installation and could have caused someone's death." Large-diameter machines have already been developed abroad--especially in the United States--with blades made of composite material but requiring relatively costly technology. The Aerowatt Company had therefore believed that to sell such machines they would have to make it up on the manufacturing costs. "They therefore resolved to make the blades as cheaply as possible, out of aluminum rods. The problems appeared in the fastening to the rotary axis. The accident obviously brings into question the fastening of the blades, but reliable solutions may be envisaged. Aerowatt had deliberately chosen a difficult way, for which it may have been inadequately prepared. This program should be reviewed, employing every precaution."

The EDF remains favorable to installations of the Ushant type for the overseas departments, if the new development does not greatly increase the cost. In France we have hydroelectric power plants, thermal power plants, including those in the nuclear program which furnish a kilowatt hour costing one third as much as a kilowatt hour of the fuel-powered power plants, which itself is clearly less expensive than

the kilowatt hour produced by diesel fuel. Although in the overseas departments wind energy may be competitive with diesel in the home country, this form of energy would have to be three or four times less expensive in the home country. Considering the size of the machines, it is quite illusory to think that an installation like the one in Ushant could produce a kilowatt hour for around 15 to 20 centimes.

Aerowatt

Paris INDUSTRIES & TECHNIQUES in French 20 Jan 81 pp 8-9

[Article by Andre Larane: "Aerowatt: Second Wind"]

[Text] "Ushant goes on." Jean-Marc Noel is not troubled by the memory of the accident that occurred at the island's windmill in July 1980, 8 months after it was coupled into the electrical system. His team's know-how is not in question, and after June the machine will again be producing its 100 electrical kilowatts. Aerowatt's director manifests a warm and smiling optimism. Several months ago he asserted that wind energy would always be an important factor in metropolitan France. The Ushant experience seemed insignificant to him compared to the hundreds of aerogenerators that feed signals from microwave relays and beacons in the far corners of the world. And Aerowatt continued to specialize in this restricted but certain market.

Today, opinion is reversed and no one will complain: J.M. Noel perceives a "sentimental" demand in France, important enough for the company to be most seriously interested. All the more so because it is in a position to begin standardization and series manufacture of low- and medium-power machines. The final stage of the process would be exporting to needy regions. "Whatever is done, wind energy is still much more costly and irregular than nuclear-powered electricity, distributed by the EDF system. Since nearly all French housing units have an electrical line at their door, wind is financially absurd...But I realize that many individuals are thinking in terms of autonomy. They are prepared to pay more per kilowatt hour, provided they have a guarantee against any oil shortage or stopping of nuclear power plants. So we will manufacture models in accordance with their wishes."

The kilowatt hour costs no less than 0.30 francs. It declines as the diameter of the blades increases from 1.20 meters to about 9.20 meters. With the latter dimensions the power reaches 5 to 30 kilowatts. A 30-kilowatt windmill costs between 150,000 and 200,000 French francs and a 60-watt windmill costs 11,000 French francs. Built of unoxidizable steel and aluminum alloy, it is calculated they will last 20 years. In the future, the use of composite materials for the blades may contribute to lowering the selling price. But wind energy has the inconvenience of being uncertain. And there is no question of installing storage batteries, as is done on beacons or microwave relays, because this would double the installation cost. It is conceivable that the EDF will one day buy up surplus wind energy, as is done for medium-voltage electricity of hydraulic micro-power plants. However, individuals should not expect a source of profit: in Denmark, where this type of energy is strongly encouraged because of the absence of nuclear power plants, the electricity company is buying up surplus kilowatts at 0.15 francs, whereas the public price is around 0.30 francs.

Mr Noel is also putting his hopes on the installation of low- and medium-power aerogenerators abroad. "There are very many adequate sites. They are islands and archipelagos, of course: Philippines, Caribbean, Pacific. But they are also isolated cities in Siberia or the Canadian Great North, which are human archipelagos in their

way." A twin sister of the Ushant windmill, with 9-meter blades, has been running since early this month on the Aerowatt test site in Landes. It is intended for export projects.

Is exporting a long way away? "Oh, no!...On 30 June a 100-kilowatt machine will be installed at Bellacorick (Ireland). Another one is in the study stage on the Aegean Sea." And Mr Noel surreptitiously divulges that discussions are in progress with the Soviets. They have the means to build aerogenerators, but lack the know-how. "Remember, our team has been working on wind energy for 30 years. We have the benefit of that continuity, unlike the American companies, which are very ephemeral. Also, we are not equal in soundness and reliability. In Greenland, for example, 20 aerogenerators are feeding microwave relays with no problems. Ten more have just been ordered." Because of difficult access conditions, requiring helicopters, they are designed to withstand for over a year with no visit and no maintenance. The market goes beyond the polar zones: even the Papuans of Port Moresby have addressed the Parisian firm. Not to mention the Americans. They favor installations for individuals with fiscal credits reaching 40 percent of the investments set aside for renewable forms of energy.

Like the Canadians and the Danish, the Americans are planning high-power units. But J.M. Noel thinks it is insane to claim to solve energy problems in this manner. He likes to remind one that one section of the future Plogoff power plant is the equivalent of 700 windmills 91 meters in diameter, lined up along the coast of Brittany.

There is yet another field in which sophisticated technologies have no chance: the field of "cow windmills." The light wings that revolve over the ranches of the New World or Cretan farms have the advantage of costing their users very little. They pump water for the drinking troughs or the irrigation canals, but they do not have enough power to furnish electricity. Aerowatt's director will not go so far as to manufacture that kind of machine.

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CSO/ 3102

ENERGY

DISAGREEMENT ARISES OVER PACE OF WIND POWER PLANT PRODUCTION

Stockholm NY TEKNIK in Swedish 22 Jan 81 p 2

[Article by Mikael Holmström]

[Text] Sydkraft [Southern Power] is prepared to apply this year for permits to erect three big wind power plants in Maglarp, Skåne. This is to get the wind power industry under way, and that requires quick orders; otherwise Sweden's leading position is threatened, with lost export orders and flight of technicians as a result.

But now the whole thing may be held up by political disagreement; the Center Party is in favor, while the Conservatives do not believe in the industry's arguments.

"As soon as we have reasonable assurance of a favorable decision, orders for a number of units should be considered for putting into operation as soon as possible."

That is what Anders Björgerd, director of Sydkraft, and Göran Ekberg, general manager, said in a letter to the government. The letter indicates that Sydkraft is prepared to speed up efforts to get the Swedish wind power industry going.

An entirely new situation has thus arisen. What for several years has been the domain of wind power researchers and politicians has suddenly become a question of industrial policy, employment, and specific permits.

Sydkraft is already working in the wind power field. In November the world's second biggest wind power plant will be completed at Maglarp, Skåne. It is Sydkraft that will handle the test operation on the instruction of the state wind power researchers.

The power plant at Maglarp (and one at Näsudden on [the island of] Gotland) is the final phase of a state investment in this type of wind power plant.

According to the state plans it was intended that the power plants would run for at least 2 years of testing before the politicians made up their minds in 1985 whether wind power is anything to invest in.

But now the industry is going against these plans. The starting shot came from the state wind researchers, the Energy Production Research Board (VEI), which

suggested in October that wind power should be developed faster, that three to five power plants should be ordered during 1982 if the first two power plants ran well.

For a long time it has been considered at the technical level in the wind power industry that the state program calls for too long waiting times.

"The risk is that the activity will get watered down and capable technicians will leave, because they do not know that wind power has a future before it in this country," Nils-Olof Flyborg, general manager of Kamewa, writes to the government. Kamewa is the concern that is supplying the power plant for Näsudden on Gotland.

Kamewa is not mincing words; this is a warning that we may lose the good position Sweden has achieved in the world and that the United States will become completely dominant on the wind power market.

"We see that as a waste of the money that is now being invested in wind power in Sweden."

The power plant in Maglarp is being built by Karlskronavarvet, which is collaborating with the American firm of Hamilton Standard. Through this collaboration Svenska Varv has gotten orders in the United States for a power plant and is negotiating right now for the world's first commercial order, for 20 to 25 wind power plants for Hawaii.

"There are significant possibilities of establishing wind power as a commercial source of energy under certain conditions," Erland Wessberg, managing director of Svenska Varv, writes to the Minister of Industry.

Wessberg compares Svenska Varv's situation with that of its collaborating partners in the United States, where power companies are getting support if they invest in wind power. To get part of the orders in the United States Sweden must invest itself.

"Our chances of transferring the production of mechanical parts to Sweden would increase considerably if the authorities would show a serious interest today."

Sydkraft Willing To Take Risk

But Vattenfall [the Swedish State Power Board] does not see that any new decision should be made as early as 1982, Jonas Norrby declares. The private Sydkraft is thus making an entirely different decision. Although Sydkraft warns against too large-scale investment, it declares:

"We are always prepared to accept a certain amount of risk in connection with the introduction of new technology in a power system," and goes on to discuss a guaranteed kWh price, i.e. guarantees from the state. Sydkraft is also prepared to apply under the building law within this year for permits to build three more power plants at Maglarp.

Sydkraft insists on the need for quick measures so that decisions on several power plants can be reached soon and then be as well founded as possible.

Political Conflict

This situation has already occasioned political disagreement. The politically constituted Delegation for Energy Research does not share the industry's views at all:

"In the opinion of DFE [Delegation for Energy Research] there is still uncertainty about the competitiveness of wind power. The energy policy need to maintain industrial competence until a position is taken on wind power by the middle of the 1980's should therefore be made clear," it writes, and says that even though competence is needed, that can be managed without construction of more power plants. Pär Granstedt, the Center Party member of the delegation, entered reservations against the decision.

Per Unckel, the Conservative, was in favor of the DFE decision, and says that wind power has already cost a lot in research money. Per Unckel does not accept the industry's talk about flight of technicians:

"I do not believe in the argument. I am not afraid that we shall no longer have competence in 1985. The industry can never demand that the state provide a home market for it."

It is not likely that the Conservatives' view of wind power is shared by the Center Party's Minister of Industry. According to NY TEKNIK's information, Nils G. Åsling is going to call the interested parties together for discussions of faster wind power plant construction.

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CSO: 3102

ENERGY

'BIO-PELLETS' WILL PLAY BIG ROLE IN FUTURE ENERGY PLANS

Stockholm NY TEKNIK in Swedish 22 Jan 81 p 7

[Article by Hans Werner]

[Text] Some 10 factories for pelleting biofuel are about to be built here and there in Sweden. Bark, chips, peat, and trash are made into balls that are easy to handle and cheaper from the energy point of view than home heating oil. Bio-pellets are expected to take up a good deal of space in the coming energy bill.

What has contributed to the fast-kindling interest in biofuels in the form of pellets, apart from rising oil prices, is the formation of the oil-replacement fund. Since the first of the year it has been possible to borrow state funds.

How much will go into domestic fuel sources in the future remains to be learned from the figures in the expected energy bill. It is already clear that bio-pellets should be a fuel to be reckoned with, and soon.

A group of experts, consisting of Olof Karlsson, adjunct energy consultant with Köping; Prof Gustaf Sirén of the forestry university; and David Arthursson, research engineer, Enköping, sums up the situation this way: Biopellets will be the Swedish fuel of the 1980's.

Four Classes

According to the report "Renewable Energy Sources" presented to the government by the Delegation for Energy Research (DFE) 22 October 1979, four classes of materials were suitable for pelleting.

A good deal has happened since then, say the three experts. The raw materials "forest energy" (formerly called forest wastes), straw, reeds, energy forest, and peat were regarded as hard to handle because of their volumes. They look quite different today with regard to accessibility. The change is called pelleting.

From a chopped and dried raw material, balls or rods 5 to 35 mm in diameter are pressed. To get the same energy as is in one cubic meter of heating oil it takes nearly 2.5 tons of pellets, which have a volume of 3 to 4 cubic meters.

An earlier problem with pellet production was the high cost of drying the raw material. But with a new (vacuum) technique the cost can be kept down to an acceptable level, the three experts consider.

The raw material is dried down to about 13 percent water content. It is then pressed into 5 to 35 mm balls or rods 10 to 80 mm long depending on the equipment used. The compact pellets or rods have about twice as high density as ordinary wood.

We thus get a domestic commercial fuel that can be delivered to the consumers at lower energy cost than home heating oil.

The distribution of pellets can be done by tank truck and the old oil tanks, after cleaning, can be used for fuel storage.

The next step is to devise an automatic stoking of high efficiency. It can never be as convenient as oil firing, but servicing can be reduced to about half an hour a week for removing the ashes.

Since pellets are a concentrated and well-defined fuel, the furnace can be adjusted with great accuracy. The efficiency will thus be nearly as high as can be attained with oil firing.

Replaces Oil Burners

Pellets thus offer the possibility of replacing oil with biofuel without too great investment costs. The best economy is attained when the conversion is done at the time of normal replacement of the furnace or burner or in connection with new construction.

Another interesting market for pellets is small industrial furnaces, say up to 10 MW. Because of the higher consumption the lowered fuel cost makes a considerably greater contribution to covering the wages for increased servicing and depreciation.

From the budget point of view firms will also be able to calculate their fuel costs more easily in the future with a conversion to domestic fuel, since they will largely follow the consumer price index and not the unpredictable decisions of OPEC.

Combats Pollution

Biopellets represent an active fight against pollution, in two respects. On the raw-material side, e.g., cultivation of energy forest often brings about a rise in the pH value of the soil, either through liming or because of rotting foliage. This increases the soil's buffering capacity against airborne pollution, the group of experts say.

Then if we look at the combustion side, biopellets give a lower sulfur emission than low-sulfur oil per energy unit. Moreover, this sulfur is taken from the top layer of soil and thus does not enter into a cycle like carbon dioxide. For heavy metals the situation is still better.

But as in all firing with biological material, some undesired emissions do occur. Problems with them can be greatly palliated by a correctly designed firing, but will have to be dealt with in the course of time.

Competition Results in Secrecy

At several places in the country pellet factories are already being built or planned. For competitive reasons this development has been kept very quiet. Within a few years presumably the whole country will be offered this new domestic fuel.

If the trio of experts mentioned turn out to be right, this will be just the thing for breaking our dependence on imports for energy supply. In addition, biopellets may be a way of storing cheap electric power for winter needs, to mention other possibilities.

Installations for pelleting are available for purchase on the world market. The technique is well known. On the other hand, the firing has not been entirely worked out. For that reason the Energy Production Research Board (NE) is planning a number of efforts on that side.

In addition the Environmental Protection Agency's researchers, according to office head Jan Nilsson, is considering doing some emission studies.

3815

CSO: 3102

ENERGY

FRENCH-BRAZILIAN TALKS ON ENERGY COOPERATION

Paris AFP SCIENCES in French 29 Jan 81 p 1

[Text] Paris--The president of the Brazilian Republic's visit to France: Economic and energy problems are the focus of the talks between President Valery Giscard d'Estaing and the Brazilian head of state, Gen Joao Figueiredo, who arrived in France on 28 January for a five-day official visit, accompanied by several ministers.

From their first tete-a-tete the two heads of state demonstrated a "common desire" to lower their countries' energy dependence and develop cooperation in that area, an official source indicated. The favored sectors are /coal, hydroelectric energy and the biomass (carburol)/ [underlined].

French authorities last year granted Brazil a credit of 2.5 billion francs, and during Gen Figueiredo's visit they are to sign another financial protocol for a comparable amount for several industrial projects to be developed by French firms.

The main discussions are to deal with completion of several large projects in Brazil, which will total about 5 billion francs, while the Brazilians, who are very advanced in alcohol fuels, will be able to help speed up French achievements in this field.

With regard to projects envisaged in Brazil, they involve participation in two thermal power plant programs, which would total over 1 billion francs, creation of an air control system in the southern part of the country (1.3 billion), creation of an urban subway system (470 million) and several projects in the process of being worked out, to develop waterfalls in several states of the Brazilian Republic.

8946

CSO: 3102

ENERGY

EC PLANS FOUR-STAGE BIOMASS ENERGY RESEARCH PROGRAM

Frankfurt/Main FRANKFURTER ZEITUNG/BLICK DURCH DIE WIRTSCHAFT 11. German 21 Jan 81
p 5

[Article by Dr Helmut Nieder: "Soon More Energy From Biomass? EC Commission's Graduated Plan/Modest German Involvement"]

[Text] Biomass from crop residues of agriculture and forestry production and from animal wastes offers a very promising opportunity to gather technological experiences in dealing with and using biomass. In the opinion of the experts it should be possible by 2000 to satisfy from these new sources 3 to 4 percent of the 1.25 billion barrels of oil estimated to be consumed in the EC in 1985. By way of comparison it can be noted that in the FRG 2 percent of the total energy consumption is taken care of by domestic oil production.

The EC Commission's energy research program provides for four stages of development: The efforts which were begun in 1975 in the area of biofuels (gas, methanol, ethanol), primarily from utilization of residues, are to be realized by 1985 in order to meet regional and local energy deficiencies. Conversion of agricultural and forest lands to areas for energy production is not planned in this stage.

In the second stage from 1980 to 1985 the intention is to introduce the cultivation of fruits and perennial crops for energy. In this stage the areas planned for this purpose will still be very small. This is primarily to meet, to a greater extent, local direct energy requirements. To a limited extent conversion to various liquid fuels is also planned.

Planning of the third stage for the period 1985-2000 anticipates more intensive development of energy crop cultivation, which will necessarily result in a fundamental change in the production structure for certain sectors of agriculture and forestry. These measures, however, can be realized only if the requirements for food and wood of the EC member countries are met. In this stage of development the plan calls for greater availability of biofuels in the form of alcohol compounds and so-called wood chips and wood granules. Bioalcohol, particularly methanol, is to take care of a part of the fuel requirements. However, an indirect yet significant reduction in oil requirements is seen in the use of wood chips and wood granules in the wood processing industry because its products can compete with plastic products for utilization in the most diverse processing sectors, such as, for example, the furniture and construction industries.

From 2000 on the fourth stage calls for much greater use of new methods of biomass production. In the view of experts, microbiology via algae and monocellular production will take on increasing importance because land reserves in the EC, which are in short supply anyway, cannot be further freed from food production, but on the other hand energy requirements will continue to increase. This fourth stage of biomass production would thus be independent of land and in the jargon of experts is called wet biomass.

What kind of potential for biofuel can be expected? In the opinion of experts the maximum energy value of all utilizable agricultural and forestry residues in the EC, including the production of firewood, is estimated at about 75 million barrels of oil equivalent for 2000. In this, approximately 40 million barrels of oil equivalent alone will come from crop residues in agriculture and forestry and from animal wastes. According to these predictions, the energy output of the agricultural and forestry areas planned for energy could be roughly as high as 35 to 36 million barrels of oil equivalent in 2000; in this connection approximately 28 million barrels of oil equivalent will come from the substances of energy forestry that contain lignin-cellulose.

Naturally these outputs of energy depend on the availability of appropriate areas. An interesting easing of agricultural-political problems is seen in the fact that by the year 2000, of the total of 125 million hectares of land in the EC used for agriculture, up to 10 million hectares--that would correspond to 80 percent of the land area in the FRG used for agriculture--can be used for energy production. The opportunity to equalize the deficit which exists in the EC in wood production by partial conversion of agricultural lands to forest lands with short-term rotation and thus to compensate at the same time for the excess in food production emerges as an additional advantage of this shift in production.

The research program of the Central Office for Research, Science and Education of the EC's Commission for the first 4-year period involves a total of \$10.7 million, with only 50 percent of the total costs being supplied at a time from this fund. It is assumed that the other half of the research costs will be borne by the respective member countries. This means that with full utilization of this amount for the first 4-year period \$21.4 million will nonetheless be made available.

The research program includes the following primary sectors: use and conversion of agricultural and forestry residues, production of biomass to obtain energy and the conversion of biomass to liquid fuels. It is striking that in the case of the present total of 16 individual projects only 2 are planned in the FRG; they are primarily concerned with questions of process technology. Not one scientific institute of the agriculture or forestry sector in the FRG is involved in this research program.

12124

CSO: 3102

ENERGY

BRIEFS

WIND POWER PLANT ON GOTLAND--Construction of the wind power plant at Nilsudden in the southwestern part of Gotland will begin in earnest in March. That will be the result of the county labor board's meeting Monday. By the end of the year it is calculated that this stage of the wind power plant construction will be completed. The construction had begun earlier with the pouring of the foundation. Now a concrete tower will be built with floors on three levels. A maximum of 30 men will be employed. The cost has been calculated at 5.9 million kronor according to a permit application turned in by the Energy Production Research Board. [Text] [Stockholm DAGENS NYHETER in Swedish 28 Jan 81 p 17] 8815

CSO: 3102

INDUSTRIAL TECHNOLOGY

CITROEN TO INSTALL FLEXIBLE WORKSHOP AT TOOLING PLANT

Paris AFP SCIENCES in French 29 Jan 81 p 13

[Text] Paris--A robot project at Citroen: An automated flexible workshop is to be installed on the site of a Citroen tooling plant at Meudon; production should start up in June 1983.

Mr Nicoleau, manager of Citroen's mechanical construction division, told the press on 23 January that this project was accepted by the CODIS (Orientation Committee for Development of Strategic Industry), which is responsible for helping business firms to invest in a number of priority sectors, and is under the Industry Ministry. The workshop project represents 32 million francs in investment, 19 million of it in materials and the remainder in studies, and has received from the CODIS 8 million francs in the form of credited loans.

This is the first project of its kind to be accepted by the CODIS since it was created in December 1979.

This flexible workshop project was presented by the "Industrial Automatic Company," which was founded last November with 30 percent of its capital held by Peugeot SA, 40 percent by SG2, a subsidiary of Societe Generale, 10 percent by Thone-Poulenc and 20 percent by other manufacturers. The company's precise object is to draw up industrial projects integrating robotics, either for companies holding capital or for foreign companies.

In a flexible workshop the machines can be used to manufacture different parts successively, while in a classic workshop the machines are designed to always produce the same part. The workshop in the Citroen Meudon plant will manufacture small cadences, prototype parts (no more than 100 per series) for the study desk (Carter, Culass, etc.). The machines will be programmed and connected with each other by a computer system. The whole will operate 24 hours a day. It will employ 20 persons in 3 teams, whereas 60 persons would be required to provide the same rate of production in a classic workshop.

INDUSTRIAL TECHNOLOGY

LURGI IMPROVES SINTERING PROCESS BY REUSING WASTE HEAT

Frankfurt/Main FRANKFURTER ZEITUNG/BLICK DURCH DIE WIRTSCHAFT in German 21 Jan 81
p 5

[Text] The Lurgi Co. reports that by using an advanced sintering process the company intends to decrease the specific heat consumption of the process and at the same time improve sinter quality. For the first time the new design will be realized in the construction of a sintering plant having an annual capacity of 3 million tons of sinter; the company is currently building the plant for the corporation of the Dillingen Metallurgical Plant, Dillingen (Saar); it is to begin operation in September of this year. Improvement of the sintering process depends basically on recovering waste heat from the sinter cooler.

As the company also reports, the heat balance of the new sintering plant of the corporation of the Dillingen Metallurgical Plant shows that about 45 percent of the heat used is contained as latent heat in the exhaust gas from sintering and in the waste air which accumulates while the sinter cools. The 300-400°C hot waste air is utilized as preheated combustion air for a combined ignition and heat-treatment furnace. In addition, the available excess quantity is fed directly into the sintering bed via a simple sheetmetal hood which is connected in with the ignition furnace. This offers three advantages:

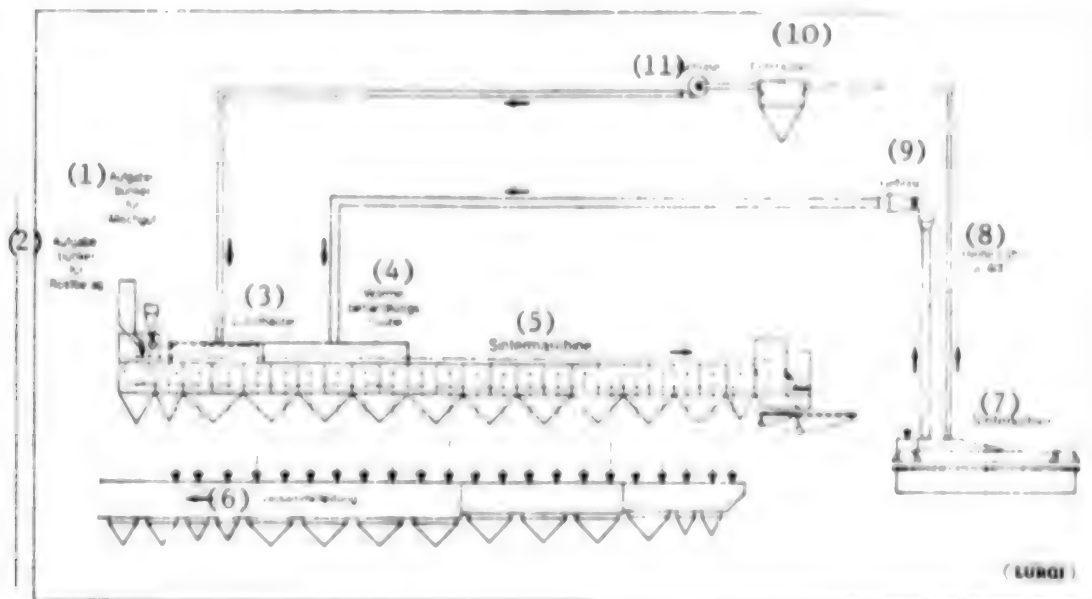
--by using preheated combustion air, gases that have a low thermal value can be used to ignite the sintering mixture;

--by combining gases that have a low thermal value with the preheated air for combustion, heat can also be introduced to the sintering process via the gas phase to supply the requisite ignition energy. This measure lowers the specific consumption of coke which makes it possible to replace expensive solid fuels with cheaper gaseous energy;

--in addition, the direct return of the hot waste air to the sintering bed reduces the specific coke consumption. According to Lurgi, since this waste heat is now available, a less favorable exchange ratio of gas/heat to coke/heat as compared with the good exchange ratio in the case of the ignition and heat-treatment furnace can be tolerated. The energy saving measures result in improved quality; in particular, however, a major benefit is the fact that the sinter quality becomes more uniform.

The sintering process was introduced in the metallurgical industry more than 5 decades ago. In this process fine-grained raw materials (0-8 mm) are agglomerated in order to be utilized in the blast furnace in the appropriate grain size (5 to 50 mm). In the beginning the sintering process played only a very modest role in the production of pig iron. It served primarily to agglomerate fine-grained waste products and circulation materials which, because of their high iron content, were valuable, but because of their fineness were not directly useable in the blast furnaces. The sintering plants were very small, in keeping with their intended functions.

In the late 1950's blast furnace technology was so far advanced that the use of iron ore sinter was recognized as an indispensable prerequisite in order to be able to operate blast furnaces at a high production level with improved quality of the pig iron. That started rapid development which imposed totally new demands on plant size and automation. For example, in Germany the share of sinter in the blast furnace burden rose from 26 to 70 percent between 1956 and 1978. Specific coke consumption in the same period was reduced from about 830 to 450 kg of coke per ton of pig iron. In the mid-1970's increasing investment and energy costs resulted in new demands on the sintering process. The quality of the sinter rose once again, at the same time it was possible to lower heat requirements.



- | | | |
|------|---------------------------------|-----------------------|
| Key: | 1. Feed hopper for mix | 7. Sinter cooler |
| | 2. Feed hopper for rust coating | 8. Hot air (ca. 400°) |
| | 3. Ignition hood | 9. Blower |
| | 4. Heat-treatment hood | 10. Dust remover |
| | 5. Sintering machine | 11. Blower |
| | 6. Gas collecting main | |

12124
CSO: 3102

TRANSPORTATION

DENMARK HOPES FOR KEY POSITION IN ELECTRIC CAR INDUSTRY

Copenhagen BERLINGSKE TIDENDE in Danish 21 Jan 81 part 11 p 5

[Article by Finn Knudstrup]

[Text] Danish industry and the electric power stations are ready to go into international electric car production.

The Danish electric power stations and the Industrial Council want to ensure a prominent rôle for Denmark if the electric car develops into an alternative to the gasoline or oil-driven car in city traffic. It will not be as a manufacturer of electric automobiles, however, but as an important subcontractor. The Danish electronic industry seems made to be a supplier to an international electric car production.

At a meeting of the newly established Danish Electric Automobile Committee the other day the chairman of the Danish Power Companies Association, Jacob L. Hansen, said that the electric companies are especially interested in the widespread use of electric cars. They can be tanked up overnight with electric current, which the electric companies have in reserve anyway. If electric cars amount to anything, the chairman of the power company assn. is already thinking about cheap rates. To start with, the fuel cost of an electric car per kilometer is half that of a gasoline-powered car.

But electric cars still suffer from the handicap that they are more than twice as expensive to buy and can only run 50 to 100 km on a tankful of current, and that the top speed is limited to 50 to 60 km an hour. But it is expected that electric cars of twice that performance will be ready in a few years--from General Motors among others.

Jacob L. Hansen conceives of the electric car system of the future with sockets in the parking meters and charging facilities at places of employment, so that even people that live a long way from their work can get their cars charged up for the trip home. But the main charging up will be at night to take advantage of the nighttime low in demand for power.

But we are hardly to expect any electric car boom in the next few years. At any rate Niels Ole Gram, office head at the Industrial Council, estimates the European electric car production in 1990 at between 0.4 and 7 percent of the total automobile production--depending on whether lower or higher-yield batteries are invented.



Denmark can become an big, important supplier of parts for electric automobiles--motors, batteries, circuits, etc. Here is one of the most promising electric cars thus far, a Fiat that can run at 75 km an hour with a range of 70 km per charge.

between now and then. But this estimate covers only passenger cars, while the corresponding prediction for delivery vans is that between 4.5 and 11 percent will be electric-powered within 9 or 10 years and for [street] buses between 14 and 36 percent.

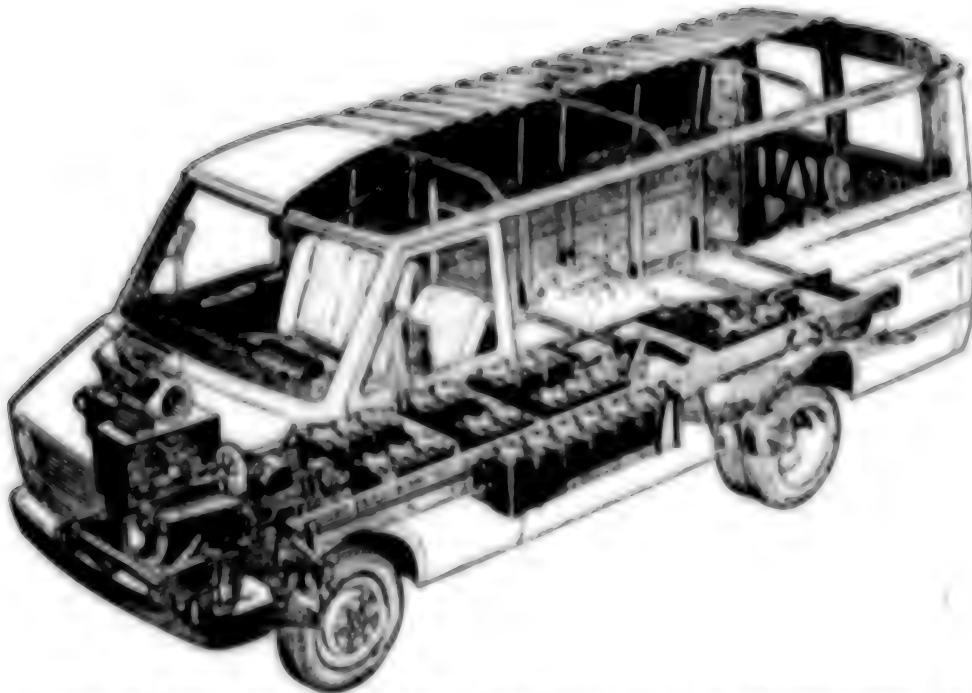
The office head says that Denmark is especially well equipped to get into that modest production, precisely because the size of it is not so overwhelming. Denmark holds its own with regard to such pockets of a market.

Niels Ole Gram points out that Danish industry is already involved in international automobile production when it comes to such components as batteries, gaskets, tools, dashboard instruments, cables, artificial leather, springs, brakes, clutches, and gearboxes--production fields that fit fine with electric cars.

To all this may be added the fact that Thrige-Titan is already a big supplier of electric motors for battery-driven forklift trucks (11,000 a year) and that Denmark in general has an outstanding electronic industry with world-class research and development.

But, as John Jensen, director of research at Odense University, expresses it: "The only ones that know how automobiles are made are the international automobile factories." We must therefore content ourselves with being subcontractors to the foreign giants.

The Danish Electric Automobile Committee acknowledges that the electric car is still too expensive and its performance too restricted for it to be able to compete with the gasoline driven car, in spite of all its environmental and energy



This delivery van, also made by Fiat, will be test-driven in Odense as part of an EC testing program. It can go 100 km on a "tankful" of current, can do 60 km an hour, and has a capacity of 1,000 kg of cargo. It will presumably be used as a mail or newspaper delivery car or to take hot meals to the elderly.

advantages. For that reason the committee, which numbers among its members leaders of industry, electrical power supply, and public authorities, is working primarily on electric cars as delivery vans--for distribution of mail, newspapers, retailers' commodities, food for the elderly, etc.

And with buses--but there are also problems involved in making battery-driven buses, because a city bus runs between 300 and 400 km a day, and that is too far for a tankful of current. For that reason, in the Odense and Århus mass transit companies the visions of the future run to trolley buses that can leave the city mains and run on battery power in the surrounding areas, and to buses that have batteries in a trailer that can be exchanged a few times during the day's run.

8819

CSO: 3102

TRANSPORTATION

ELECTRIC CARS VIEWED AS STILL NOT COMPETITIVE

First Danish Electric Car

Copenhagen BERLINGSKE TIDENDE in Danish 14 Jan 81 p 1

[Text] The first modern Danish electric car was last Friday presented at the Industrial House [Confederation of Danish Industries] in Copenhagen. The car, which is primarily intended for internal transportation in public and private companies, has been manufactured by the Merrild Engineering Works at Herning. After the presentation which is taking place in connection with an orientation meeting of the Danish Electric Car Committee, the electric car will be handed over to the Municipality of Copenhagen for use in the Old People's Town.

The Merrild car has a maximum speed of 60 kilometers per hour. The radius of action ranges, depending on the load, between 45 and 60 kilometers. Ex works, the car costs 52,000 kroner.

Already at the present time the operating costs of electric cars are competitive. Based on the present energy costs, 1 kilometer in an electric car costs only half as much as 1 kilometer in a gasoline operated car.



Too Slow, Short Range, Expensive

Copenhagen BERLINGSKE TIDENDE in Danish 15 Jan 80 pt II p 2

[Article by Finn Knudstrup]

[Text] Even if the first Danish electric car will be presented in Copenhagen tomorrow, it still is not very likely that it will be able to compete with gasoline or diesel operated cars for quite some time.

Even if the first Danish electric car will tomorrow be presented with great optimism at an electric car seminar held at the Industrial House in Copenhagen, neither this car nor the foreign electric cars will have any real chances with the ordinary driver. It will still be a long time before electric cars will become the property of the ordinary man.



Saab has built this electric car as an experiment for the Swedish postal services at Malme.

The biggest, and still unsurpassed, problem of the electric car is its short range on a tank of energy. Only well over 50 kilometers on one charge. Also the maximum speed is limited. Approximately 50 kilometers per hour. To this comes a shocking cost! Well over 150,000 kroner.

In other words, in the year 1981, the electric car is far from being able to compete with gasoline/diesel operated cars. Put bluntly, the electric car has only half the performance, despite a cost which is nearly double.

More Expensive Than a De Luxe Volvo

It is true that the cost of a Danish electric car ex works will be only 52,000 kroner. But if the car is to be used on public roads, the special Danish automobile taxation will add a tax of 180 percent plus value-added-tax, causing an electric car with white license plates to cost around 150,000 kroner. The conditions are the same for ordinary cars. But by way of comparison, a big de luxe Volvo at 130,000 kroner ex works costs only 42,000 kroner, thus considerably less than the small two-seat Danish electric car from Merrild's Engineering Works at Herning.

There is a good explanation why despite the good will and great interest in the car, only 7 (!) electric cars have been registered in this country. All of the seven cars are tax-exempt because it is a question of an experiment. For the cars belong to the Danish power stations, which 3 years ago paid 80,000 kroner for each car. That is to say, excluding taxes.

Operate at Half Cost

The seven electric cars are British and have done extremely well in this country. If one disregards the initial cost, the cars are most competitive in operation compared with gasoline operated cars. NESA's electric car runs 1 kilometer for only 32 ore--that is half the cost for the same distance driven in a VW van, which comes closest to the electric car. But the VW van costs only half as much--even without taxes.

On the other hand, the power companies have literally no repair costs on electric cars. They just run, and they are completely silent. Because of the range on one charge, NESA's electric cars must remain within the Hellerup-Lyngby-Bagervad area in order to be able to get back for the nightly--and life-giving--charge. However, the car could be kept running longer if it were possible to exchange batteries on the road. But both the number of batteries and their weight are so big that the car would not be able to take along such a reserve tank by itself.

Electric cars in Great Britain which run longer distances, therefore, operate along regular routes with service stations on the way with new batteries waiting for the electric cars.

Many efforts have to be made before electric cars will also in practice become competitive compared with oil operated cars. Most automobile makers, therefore, have more or less abandoned their electric car plans.

GM Believes in Electric Car

There is one exception, however, and that is General Motors. This company, the world's biggest automobile maker, has just stated that it will in 1985 be ready with mass-produced electric cars with the hitherto most interesting data: Maximum speed of 90 kilometers per hour. Range: 160 kilometers. This opens up the possibilities for electric cars. Nobody outside GM's secret test tracks has seen this electric car, but it is known that, despite all of its merits, it only accommodates 2 people and only holds 200 liters of luggage. It is thus a question of a very small car inside--it has been filled with batteries.

By way of comparison, the Danish electric car's data are 60 kilometers per hour, range 60 kilometers.

A number of electric cars and buses have, time and again, been tested in this country. But the number has never exceeded the 7 electric cars, says information officer Jørgen Gullev, a graduate engineer with NESÅ, and probably the Dane who knows most about electric cars.

He admits that the possibilities of the electric car on public roads are small in this country as long as the taxes on cars hit as hard as they do at present. However, several hundred non-registered electric cars drive around within closed areas. They are known, for example, as gasoline cars and snacks cars at the Great Belt ferry stations and as passenger cars with the Danish State Railroads and P & T. But automobile people refuse to recognize such vehicles as actual cars. The condition is that they be registered. And here the automobile tax is an obstacle.

Will Operate on Sea Wave Energy

Jørgen Gullev states that the electric car advocates have sought to obtain permanent tax exemption with the minister of fiscal affairs, Karl Hjørtsmas, but that the minister will only grant exemptions in connection with actual experiments.

In addition to low operating costs, the electric car has vast environmental advantages. It runs without dust and smoke emissions. This means that no waste gases are emitted in the street, they remain within the power stations. The electric car, moreover, operates on all kinds of energy. It is independent of oil and does not care what fuel is being used by the power stations. It runs equally well on coal, wind power, solar energy, sea wave energy, and nuclear energy, or whatever the possibilities might be.

And it makes next to no noise. This, of course, is a good thing, but it also has its disadvantages. For motorists have become used to cars making noises. For that reason, dangerous situations may arise when a silent electric car comes sneaking along. BERLINGSKE TIDENDE's automobile reporter has experienced the truth of this on test runs in this country as well as abroad.

Still a Long Way to Go

If one takes stock of the electric car in 1981, one arrives at the somewhat discouraging conclusion that, measured in terms of costs and technical performance,

the electric car does not compete at all with gasoline operated mass-produced cars. Its big heavy load of batteries hampers it and limits its use. If lighter and more powerful batteries are invented, and this may not take too long, and if electric cars are mass produced, it will probably be possible to reduce the production cost to the level of that of ordinary cars. And if customers may then be tempted with operation at half cost, no smoke emissions and no noise, it probably will help. But the present batteries are no good. The turning point will hardly be reached until the power source of electric cars takes up no more space and weighs no more than the gasoline tank of a conventional car.

In other words, there is still a long way to go.

The prospects are somewhat brighter for electric buses. Here the low maximum speed and the short range play a smaller role. The German automobile works, M.A.N. and Mercedes, are thus also working on realistic electric bus projects. Here there are two possibilities: An entire electric bus with batteries placed in a trailer. And a trolley-bus which can leave the urban network and continue in the suburbs on batteries it takes along.

7262

CSG: 3102

TRANSPORTATION

FIAT PRODUCES HYBRID BUS FOR USE IN CITIES

Milan L'UNITA in Italian 2 Feb 81 p 7

[Article by Fernando Strambaci]

[Text] Current research on hybrid vehicles is influenced by many factors. For example, in Germany there are some who study hybrid vehicles mainly for ecological purposes but who are also interested in features leading to economy of operation. In fact, hybrid systems make it possible to take advantage of two types of primary energy (electrical and thermal) to move a vehicle. In this connection, a bus is driven outside the city by a thermal (diesel) motor for ecological purposes and by a silent and almost nonpolluting electric, battery-powered motor when in the city limits.

Hybrid systems designed for economic fuel consumption are generally built to supply fuel in accordance with the amount of power demanded of the fuel source: the diesel and electric power sources overlap in variable percentages in each individual case in order to respond precisely to the speed requirement demanded by the driver through the accelerator. Let us cite an example. Within the scope of the National Research Center's Finalized Energy Plan-Subproject Drives, the Fiat Research Center has developed a battery-powered hybrid bus based on the traditional Iveco model used for city transportation.

The Fiat 418 Al bus seats 100 people and is equipped with a diesel drive which, based on fuel-consumption tests made according to the CUNA cycle, consumes 37.8 kg of fuel per 100 km. The adoption of the CRF hybrid drive system makes it possible to use a lower-horsepower diesel motor which operates, for the most part, at constant delivery. Thanks to this and other clever devices, consumption has dropped to 31.5 kg of fuel per 100 km, or a decrease of more than 16 percent.

Moreover, it should be pointed out that the CUNA norms involve operating conditions which are more strict than those encountered in our normal city traffic. Recordings made on the spot have shown that, whereas the average speed of the cycle based on the norms is 22 km/h, in reality, the speed did not exceed more than 15 to 18 km/h.

The battery-powered hybrid bus, which has already successfully completed a number of test runs on a specified track and on streets open to the public, has a drive system arranged as follows: in the beginning there is a diesel motor which drives a continuous-current generator, and this, in turn, supplies an initial level of

power required by the wheels; when the power demanded exceeds this level (for example, in the acceleration phase, at full load and going uphill), the surplus is furnished by a series of batteries.

Passing through an impulse regulator (chopper), the power arrives at the electric drive motor.

In the braking phase, the same drive motor operates in such a way as to charge the batteries. In addition to the recovery of energy, there is the advantage of a braking action which is more comfortable for the passengers in that it is more gradual and less abrupt than that of the conventional hydraulic brake.

The use of batteries is dictated by logic, both on the basis of power demand and on that of the level of their degree of charge.

A second hybrid system--with flywheel--is in the experimental stage at the laboratories of Fiat's Research Center and, in the near future, will be installed on a bus to be road-tested.

The operating principle is similar to that of the battery-powered hybrid. Again in this case, the diesel arrangement furnished the first level of power alternatively to the wheels and then to the flywheel through suitable electrical devices.

The operation involved in accumulating enough power to reach the second--higher--level of power is thus taken over by the flywheel. The power which is accumulated during the braking phase is used to spin the flywheel; this, in the active stage, feeds a generator to produce the electricity necessary for the drive motor. Rigorous tests were performed on the flywheel, the flywheel casing and the entire system. In view of its high rotating speed (12,000 rpm), it is necessary for the flywheel to rotate in a vacuum inside the casing to prevent the surface from becoming overheated through friction with the air. In like manner, the flywheel could disintegrate due to centrifugal force. Thus, it was necessary to consider the use of a flywheel with aluminum-alloy hub and external ring of steel wire or wire made of "kevlar," a refined synthetic material. In both versions the flywheel weighs about 120 kg and has a diameter of 80 to 120 cm.

Once the system has been perfected from all aspects (vacuum arrangement in the casing and lubrication of the various components), Fiat's flywheel-type hybrid bus will also be ready to be tested.

TRANSPORTATION

STUDIES SHOW WIND-TURBINE POWER POSSIBLE FOR SHIPS

Bern TECHNISCHE RUNDSCHAU in German 11 Nov 80 p 15

[Article by C. T. Nance: "Ship Power of The Future?"]

[Text] In the worldwide efforts to conserve fossil fuels, abundantly available wind energy is there to be used in shipping. It is entirely probable that the industry will come under increasing pressure to utilize wind energy for shipping wherever it appears sensible. An economic comparison of ships with pure wind propulsion systems (equipped with low-powered conventional engines solely for passing through calms and for entering harbors) with combination wind-fuel propulsion systems as well as with systems based exclusively on fuels would probably come out about the same for all three systems based on present prices.

A more detailed analysis, however, permits the conclusion that in many instances studies that related the basic economy of shipping lines to the wind energy along their routes could definitely lead to the development of an economical system. In many cases the advantages could be exploited by the conversion of existing ships, while in others completely new developments would be required.

The present study on research work in the area of ship propulsion does not wish to create the impression that this is the solution for the majority of all problems, or that shipowners should await the results of work in progress before seeking advice about the economic possibilities of wind propulsion.

In examining all the possibilities, from kite wings, traditional fabric sails and rigid airfoils to Flettner rotors and wind turbines, it becomes clear that the wind turbine offers a number of unusual qualities. If the power generated by this type of turbine can be transmitted to a screw, the clear possibility exists of steering the ship in any desired direction, even directly into the wind. A ship like this must be regarded as machine-driven.

The wind turbine is a mechanical system; the technical competence required for its design, construction, operation and service lies within the scope of existing industrial possibilities. The wind turbine could, therefore, be introduced without great difficulty. In contrast to the Flettner rotor, the air resistance of the turbine could be reduced to a small proportion of the surface presented to the wind when the ship is lying at anchor. A reduction in wind resistance of this amount would be of great use with respect to fuel consumption when the ship has to resort to combustion engines in light winds.

While the development of Flettner windmills as well as soft or rigid sails or airfoils would have to be borne by a ship construction industry, an extensive development program for wind turbines exists in connection with the generation of electricity. The conversion of the turbines for ship propulsion would demand relatively little time and money.

Accordingly, there is much to be said for investigating more closely the competitiveness of wind turbines as opposed to other systems in regard to performance and economy. That is the purpose of a study contract which the Ship and Marine Technology Requirements Board, which is part of the British Ministry of Industry, has awarded to five organizations.* At the moment these studies are purely theoretical.

The starting point for the work was a series of performance estimates by Dr John Wellcome (Department of Nautical Studies at the University of Southampton), which were published in 1975 (RNA Occasional Publications No 2). These estimates can be shown in graph form. From the curve it can be seen that, although the wind turbines cannot be expected to deliver the best performance from a navigational point of view on all counts, it is the only system that can be employed effectively in a majority of wind directions. In addition, it is expected to deliver more consistent performance than other systems.

Later work at the University of Southampton has shown that these expectations should not be regarded as reliable indicators of performance. But there are no signs that the task of developing a system with a performance of the same order as is attained by less suitable wind propulsion systems would be impossible. It is obvious that the type of wind turbine employed in the traditional windmill (horizontal axis, high-placed gearbox, steerability of the entire cap) is unsuitable for ship propulsion for reasons of stability. Machines with a vertical axis do not have this disadvantage.

* Atkins Research and Development, Epsom, Surrey. Medina Yacht Company, Isle of Wight. Reading University, Department of Engineering, Reading, Berkshire. St. Helena Shipping Company Ltd., Helston, Cornwall. Wolfson Marine Craft Unit, University of Southampton, Southampton, Hampshire.

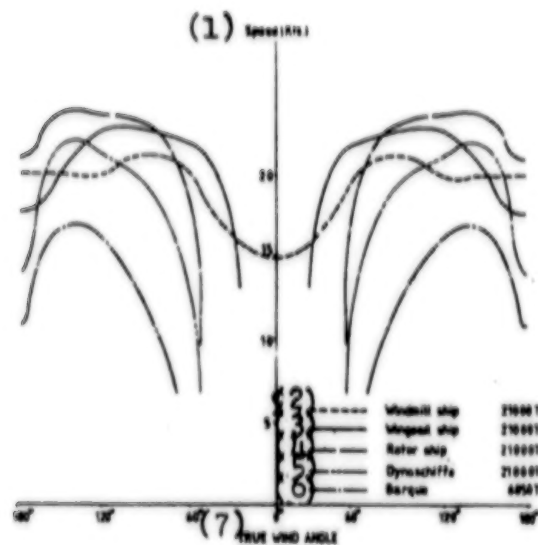


Fig 1 Comparison of the Relative Performance of Different Wind Propulsion Systems in a Force 8 Wind (Beaufort Scale).

Key:

1. Speed (knots)
2. ----- Windmill Ship 21,000 tons
3. _____ Wingsail Ship 21,000 tons
4. _____ Rotor Ship 21,000 tons
5. ----- Dynaships 21,000 tons
6. _____ Barque 6,850 tons
7. True Wind Angle

The variable geometry type developed by Dr Musgrove (Reading University) was selected for the study. It is characterized by blades which swing outward under load, that is, they are self-reefing and thereby reduce the working surface for the wind. Figure 2 shows a sketch of a ship propelled by two units of this type.

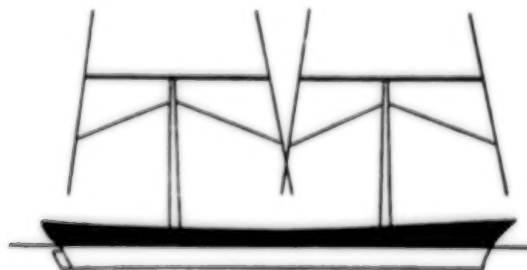


Fig 2 Ship With Two Vertical Wind Turbines.

Work on the project so far has revealed some interesting possibilities. Within the wind angles in which a conventional sailing ship is able to operate, it seems possible (by giving the turbine blades a cyclically variable pitch) to transmit a considerable aerodynamic thrust through the mast to the ship's hull, in the same way as the sails do in a sailing ship. The mode of operation is the same as that of a helicopter rotor. In addition, the torque of the screw might possibly be increased.

If the diameter of the screw is large enough, the ship can make good headway directly into the wind. But it is not certain whether more headway could be made using this method than by tacking, as in a sailing ship. With the exception of zones in which strong and constant winds can be expected, the data examined so far indicate that, for all possible methods, the wind speeds are probably insufficient to propel a wind power driven ship at an economical speed. Some additional motor power must be available. This is estimated to be about one-third or more of the propulsive power of a corresponding motor driven ship.

The study has revealed the interesting possibility that, on a course with a following wind, it might be more economical to drive the wind turbine as an air-screw using this motor power, instead of the water screw, as a supplement to the wind turbine's torque.

A rough economic comparison with a 3,000-ton ship sailing the route from Great Britain via Asuncion and St. Helena to Cape Town, has shown that a wind turbine ship would very probably prove to be uneconomical on this route, which is characterized by light winds, primarily because of the high capital costs for the construction of a passenger ship and the associated need for higher average speeds. A good chance does seem to exist that a freighter operating on the southern part of the route (the winds are generally stronger here) could bring an economic advantage.

Additional studies will make it possible to study the facts more closely and to determine whether the theoretically calculated performance can be realized in practice.

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TRANSPORTATION

BRIEFS

AIRBUS AUTOMATIC PILOT--For the first time, a test flight of the A-300 took place on 10 December 1980, with an automatic pilot and completely numerical guiding instruments. These systems will make possible automatic landings in low visibility (cat. III OACI [International Civil Aviation Organization]); performances realized by the similar SFENA [French Air-Navigation Equipment Company] automatic pilot on the A-300 Airbuses currently in service. The CADV [automatic pilot], of advanced numerical technology, has the following advantages: low mass and volume, great reliability. It is designed and developed by SFENA and will be produced in European cooperation with BGT [expansion unknown] and Smiths. To make the operators' task easier and more efficient, very advanced maintenance facilities were introduced into the system when it was designed. The A-300 Airbus is thus beginning the most important phase of the tests of the A-300-A-310 future airplane systems. The first SFENA automatic pilot order, for the Indonesian Garuda Company, will be delivered early in 1981. This system corresponds to a first stage in the perfecting of the system provided for the A-310, a year and a half before the plane's first flight, which is to take place in 1982. [Excerpt] [Paris INDUSTRIES & TECHNIQUES in French 20 Jan 81 pp 62-73] 8946

HIGH-SPEED TRAINS--Traction engines carefully designed for operating speeds of 300 km per hour will pull the world's fastest train, the Southwest Paris TGV [High Speed Trains], putting Lyon within 2 hours of Paris. The engines use the polyamide film "Kapton," an insulating material that is strong and resistant to high temperatures, which will make it possible to raise the engine to the H class for the same weight and bulk, and at less cost per kilowatt than with conventional materials. By attracting travelers onto the high-speed trains, the SNCF [French National Railroads] expects an annual energy saving of 100,000 tons of oil-based fuel on the Paris-Lyon line. Energy needs per passenger will be one fifth the requirements of a commercial airplane or half those of an automobile. Industrial production started last April, with two trains coming off the assembly line every month. A total of 50 units is expected for October 1981, when commercial operation is to begin. By 1983, when the Southwest Paris TGV is expected to be fully operational, some 87 trains will have been built. Each train being pulled by two locomotives, each containing six traction engines, over 1,000 engines will be built for the TGV between now and 1983. [Text] [Paris AFP SCIENCES in French 19 Jan 81 pp 10-11] 8946

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